

Science & Human Progress

Essays in the Honour of late **Prof. D.D. Kosambi**

Scientist, Indologist and Humanist

Preface

The news of the sudden death of the late Professor D. D. Kosambi at Poona on June 29, 1966 was received by his friends and admirers all over the world with painful shock and a deep, sense of abiding loss. The idea of commemorating in a deserving manner his life and work was mooted at a condolence meeting held on the 9th July 1966 at the Fergusson College, presided over by the Vice-Chancellor of the University of Poona, Professor D. R. Gadgil. It was followed by another meeting of some of Prof. Kosambi's erstwhile colleagues and associates for considering various schemes to preserve his memory, amongst which the publication of a Commemoration Volume was found to be the most suitable for early implementation. Soon thereafter a Committee called the "D. D. Kosambi Commemoration Committee", with its headquarters at the Maharashtra Association for the Cultivation of Science, Poona, was organized. The first meeting of this Committee, presided over by Shri V. V. Giri, now the President of the Indian Republic, was held at New Delhi on March 14, 1968 for finalising the proposals.

There was an enthusiastic response to the appeal for contributions to the Volume, made by the Secretary of the Committee, to a select number of scholars known to be interested in Kosambi and his work in the various fields of knowledge. In view of the meagre resources at the disposal of the Committee, however, especially at the initial stage, it was decided to limit the extent of the Volume to within 300 pages. It was understood that a similar Commemoration Volume but devoted almost exclusively to the study of Indian social structure was being planned by a distinguished friend of Prof. Kosambi, viz., Prof. R. S. Sharma, Head of the Department of History, University of Patna. The possibility of having a joint publication of the two Volumes was explored but this was found both impracticable and unnecessary. The present Volume is divided into three broad Sections, viz., Preface

(1) Articles in Humanities, (2) Articles in Science, and (3) Reminiscences of Prof. D. D. Kosambi and his views. The task of selecting and editing the material on such a wide variety of topics, presented in different styles of writing, and fitting it within the prescribed limits was by no means easy. Howsoever unwillingly, the sub-committee appointed for editing the Volume had not only to eliminate repetitions, and reduce some contributions to mere extracts but even to omit some of them in order to maintain a certain amount of balance and proportion in the presentation of the material. For this kind of liberty the editors have relied upon the kind indulgence of all our collaborators, bound as we all are by the common tie of friendship and sincere appreciation of the work of the gifted personality to whose memory the Volume has been dedicated.

The list of Contents will testify to the varied fare offered in the different Sections of this Volume. We will not attempt here even a brief survey of it; however special mention deserves to be made of

two important articles of a general nature, penned by Prof. Kosambi himself, which have been included herein, viz., 1. "Combined Methods of Indology" (already published in the *Indo- Iranian Journal*, Vol. VI (1963), No. 3

4, pp. 177-202) in the Humanities Section, and 2. "Steps in Science", which is being published here for the first time as coming under the Science Section. Both of them illustrate the methodological approach and style of Prof. Kosambi. The latter article is particularly noteworthy for its autobiographical content, which gives us a glimpse of the progressive involvement of Kosambi's mind into ever widening fields of interest and the development of his characteristically far-reaching, penetrating and synthetic quality of thinking. A major share of the credit for this publication goes to Bhatkals of the well-known Popular Prakashan, Bombay, who came forward to undertake the full responsibility of bringing out the Volume in its present excellent form. Without their generous gesture the Volume would not have seen the light of day.

July 26, 1974

Prof. D. D. Kosambi Commemoration Committee

Prof. D. D. Kosambi : A Brief Chronology of Major Events

July 31, 1907.....Born at Kosben, Goa.

1918. Early education in New English School, Poona.

1918-1925 Studied at Cambridge Grammar School and Latin

High School, Cambridge, Mass., U.S.A.

1925-1929 Studied at Harvard University. Graduated with

S.B. 'Summa cum Laude' and 'Phi-Beta- Kappa' membership.

1930 First published paper on scientific subject "Processions of an Elliptical Orbit" in *Indian Journal of Physics*.

1929-1937 On the staff of Benares Hindu University

May 7, 1931 Married Nalini Madgavkar, Bombay.

1931-1932 On the Staff of Aligarh Muslim University.

1932. Papers first published in French and German.

1933 On the staff of Fergusson College, Poona.

November 10, 1935 First daughter born (now Mrs. Sarkar in Sweden) .

April 24, 1939 Second daughter (Meera) born. She has had a very brilliant academic career, both in India and in Sweden.

1947 Joined the Tata Institute of Fundamental Research (Mathematics Department), Bombay.

1956 *Introduction to the Study of Indian History* published by Popular Book Depot, Bombay.

1957 *Exasperating Essays* published by People's Book House, Poona

1960 Grand-daughter (Nandita) was born.

1962 *Myth and Reality: Studies in the Formation of Indian Culture* published by Popular Prakashan, Bombay.

1962 Retired from the Tata Institute of Fundamental Research, Bombay.

1965 *The Culture and Civilisation of Ancient India in Historical Outline* published by Routledge & Kegan Paul, London.

1965 Scientist Emeritus conferred by Council of Scientific and Industrial Research, New Delhi.

June 29, 1966 Passed away in sleep at Poona.

D. D. K. A Rough Diamond

A. K. Banerjee

BANERJEE, AJIT KUMAR (b. 1909, Calcutta). Educated at St. Xavier's School and College, Calcutta, 1919-27, Trinity College, Cambridge, U.K. 1927-31, graduated in 1930, London 1931-32. Administrative experience in Martin and Company, Calcutta, 1933-34, Tata's, 1936-39, Bombay, retired as their Principal Executive Officer. Visited Japan as a Member of the Indian Salt Mission, 1965, and attended the Seventh Session of the Chemical Industries Committee, I.L.O., Geneva, 1952, 1969. Other interests: Film, Theatre, Writing, History. *Address:* C 1 Sea Face Park, 50, B. Desai Road, Bombay 400026.

Professor Damodar Dharmanand Kosambi, died in his sleep in his Poona home on June 29, 1966, just a month or so before he would have been 59 years old on 31 July. That is how a man like him deserved to die, without pain and suffering, for he had known both in his lifetime and stood for their elimination, not infliction.

He inherited his passion for learning and humanism from his father, Professor Dharmanand Kosambi, a venerable scholar and research worker, who devoted his life to the study of the teachings and philosophy of the Buddha, India's first gift to the world, and taught at Harvard University in the U.S.A.--quite an achievement for both teacher and University in those days. This explains why the younger Kosambi, known as 'Baba' to his friends, went to the U.S.A. at an early age, joined the Cambridge Grammar School, later attended the Latin High School, and finally Harvard University, from where he graduated in 1929 with S.B., "Summa Cum Laude", also winning a "Phi-Beta- Kappa" membership.

Baba had a curious attitude about pictures of himself and would not let them get around. He felt so strongly about this that he would not give a photograph of his to his class album. He remarked to his friend at onetime that he had two counts against himself, a brown skin and a "Jewish" nose. His friends suspected that he was so angry at U.S. prejudices along these two lines, that he would not let U.S. students get his pictures in an album.

His versatile and enquiring mind started to reveal itself early. For some reason or other he spent about a year or so in India before entering Harvard, studying differential equations. As a hobby, Baba worked out the usual problems of ballistics, tracing the path of a bullet not only as influenced by gravity but also with elaborate corrections for air resistance--this before his freshman year. He spent a considerable time firing a rifle and checking up on his equation's. At Harvard he registered for sophomore physics and went into the laboratory. One of the first experiments required of him was to fire a bullet into a ballistic pendulum and to work out the velocity of the bullet from the pendulum swing. The young laboratory assistant came round with the gratuitous advice that "you should use conservation of energy, equating the initial kinetic energy of the bullet with the sum of the change of potential energy of the pendulum and bullet". Baba was horrified and politely remarked that he was afraid he had misunderstood him and would he mind repeating it. He did and Baba said "Oh" and walked out of the Lab, thereby dropping the course (and getting an F for it). He had felt he had nothing to learn from such a fellow. He was the only student ever to make both an F and a "Summa Cum Laude"

One spring after the grades came out, Baba dropped into a friend's room, quite upset. He had had a letter from his father saying that he was obviously wasting his time or else he would have done better than 3 A's and a B, and that, if he was not going to work, he had better come back to India. He thought he would take a summer school course and "show him". A course in Italian was considered worth while. As usual in a first course, the instructor assigned a choice of reading three out of five student-use shortened versions of full books. Baba hunted up the five full Italian editions and also Mussolini's Autobiography, all of which he read through. At the end of the course he received a note from the instructor, giving him an A plus, with the remark that it was the first time he had ever found it necessary to give such a grade. The note was duly relayed to his father in India.

At one time a friend of Baba's was taking a course in Quantum Theory, and it came to the point of derivation of Bohr's spectrum rules. The instructor assigned an article explaining Einstein's derivation. He looked up Einstein's paper in the German original and found it very clear, although the "explanation" of his article by another writer, was confusing. He remarked to Baba about Einstein's article and was astonished to find that although he was a student of mathematics (not physics), he could remember details from Einstein's paper and knew of subsequent more elaborate papers.

Baba's ideal in the mathematics department was George Birkhoff (not the son Garet). As an undergraduate he took one or more "Research" seminars--private courses from Birkhoff, probably on the M-body problems. His forte, though, pointing towards later accomplishments, lay in his remarkable diversity --his father backed him up in this, saying his speciality was all right, but that if he wanted to go a field, by all means to do so. Hence, we suppose, his later interest in Indology, etc. Baba and Norbert Wiener were of course friends of very long standing, and the two of them were the most versatile persons ever to be encountered.

On the personal side, during his student days, Baba was much the same as in later years, full of fun and humour. He was particularly loyal to his old Cambridge Latin High School friends and those around the Cambridge Central Square YMCA. He frequently ate supper in the YMCA Cafeteria and in a little cheap restaurant at Central Square rather than around Harvard Square. His friend and he often went to a movie at Durrel-Hall, the YMCA movie theatre, where they liked the relaxation of the sillier "Westerns", with the old piano player who was not always synchronised. Baba also went swimming at the YMCA and worked out in the Gymnasium. In later years when he revisited the U.S.A. to look into computer problems Baba dropped in on the YMCA, and his old friends were so tickled to see him that they made up a party, and took him to supper and to the "Icecapades" at the "Boston Garden".

Baba used to room with his father in a beautiful room on the first floor of a rooming house at 10-Trowbridge Street. When his father returned to India from teaching at Harvard, Baba moved up to one of four unheated rooms on the top floor at \$ 4- per week, about the cheapest in Cambridge. When his friend met Baba again at South Station after he had been many years in India, he was afraid to see him changed and older. Instead he arrived with a huge knapsack on his back, vigorous and fun-loving as ever.

Recalling the story about Italian studies, in those days during the "Fall" season a student was in his room one night after his Italian Summer course. Apparently in the second half of the summer Baba read Dante by himself. Baba was asked who the student was, and he answered--"Oh, he was a young Italian student and I was giving him advice on his Doctorate thesis, on Dante". This was sophomoric, his friend thought, but he had confidence that it was good advice.

Baba specialised in pure and applied mathematics (Tensor Analysis, Probability), theoretical and applied statistics (including work on the Indian population problem), and in these his reputation was unchallenged. He won the first award of the Ramanujan Memorial Prize in 1934 and a special Bhabha Prize in 1947. Baba was UNESCO Fellow to the U.S.A. and the U.K. for electronic calculating machine research in 1948-49, Visiting Professor (Geometry) at Chicago in the winter term of 1949, and guest of the Institute for Advanced Study, Princeton, in 1949, where the main work covered several technical discussions with Einstein on his unified field theory and with O. Veblen on tensor analysis. Many invitations from abroad followed, but not all could be accepted. Among those accepted, however, was a personal invitation from the Soviet Academy of Sciences, in 1955, to lecture, and to attend their first conference for the peaceful uses of atomic energy, and a personal invitation from the Academia Sinica, Peking, to suggest statistical methods for the forecasting of Chinese food crops, and quality control in industry (these suggestions were discussed separately by Kuo Mo-Jo and Chou En-lai with Baba in person, and approved, but the results are not known). Sanskrit text study by Baba ranged from the search for manuscripts to publication. Chief among them were: *A*. Principal editions of Bhartṛhari's *Satakas*, admitted to be the best of

their sort, and as having added considerably to methods of Indian textual criticism. *B.* A recent edition published by the Harvard Oriental Series, of the oldest discoverable Sanskrit anthology, the *SubhiiSitaratnrikosa* of Vidyakara. Baba was engaged in a standard translation of the *Arthasastra*, on which his studies showed him to be the leading authority.

Indian history and culture claimed his thorough attention too. Baba's *Introduction to the Study of Indian History* received lengthy and favourable reviews abroad in the *Journal of the American Oriental Society* and the *Bulletin of the School of Oriental and African Studies* (of the University of London), not to mention others, and is supposed to mark a new stage in Indian historiography. To write it, he did pioneer work in archaeology and ethnography, showing that written sources would not suffice. He did not conceal his reliance on dialectical materialism as a methodology of study and interpretation, though on many issues he widely differed from "official Marxists", as he used to call them -- whether of the Russian, Chinese or indigenous variety.

As an Indologist, Baba was invited by the University of London (under the sponsorship of the British Council and the London School of Oriental Studies), and had a special invitation to attend the next International Congress of Orientalists. These were unsolicited, and his research bibliography listed over a hundred titles of original papers.

Baba guided the archaeological club of the National Defence Academy at Khadakvasla at the request of its first Commandant, Major-General E. B. Habibullah, who said later that he had taught them all how to do field work, to observe how to appreciate the common people's way of life. The cadets would be better citizens and officers for it, and would be closer to the people.

The investigation of trade-routes for the history book led Baba to suggest to the Government of the then Bombay State that the expensive funicular proposed for Nanaghat would only be a useless bottleneck. A motorable all-weather road could be made quite economically down the next pass to the north. This would have given the central link in a system of three trunk roads that would have developed the entire Maharashtra-Vidarbha section of Bombay State. The saving would have been at least Rs. 15 lakhs, not to speak of the profit, stimulus to trade, and communications, etc. The suggestion was not based on book-reading and maps alone but on extensive (and expensive) trips on foot, by jeep, car, or through the wildest country.

By concentrating the anti-typhoid work about three weeks before the onset of the monsoon, it was estimated that about 500 lives could be saved annually in Bombay city alone, as followed from Baba's work on the seasonal death-rate. The City medical section took this up immediately.

The construction of dams was being undertaken on arbitrary principles. If too large, the cost rises; if too small, there is every chance of the supply failing every few years. Statistical methods originally suggested by Baba to competent engineers have now been adopted by the 5-year plan committee as the basis for location and size of dams. Earlier, there had been expensive arguments (without valid basis on either side) on this question.

In the years just before his death; as Emeritus Scientist of the Council of Scientific and Industrial Research, Baba was engaged in extensive field work which led to his rediscovery of Neolithic routes, Buddhist caves, and old inscriptions. He was hoping it would lead to further discoveries of manuscripts in Nepal, Rajputana and generally in inaccessible parts of India. He was anxious to see

that the search for Sanskrit manuscripts, which was only being talked about, was undertaken very soon, before the material was destroyed or damaged beyond recovery. Baba served at the Tata Institute of Fundamental Research as Senior Mathematician from its inception in 1945-46 to 1962. When his service came to an end, he could have emigrated but disliked the prospect as he believed that his roots were in India, and that he could not work out Sanskrit text-study and Indian history as well elsewhere. He was accused of neglecting mathematics and of being an amateur Indologist, but that was not the opinion of world experts. Just before his death he was said to have completed and posted to his publishers the manuscript of his last work on Prime Numbers, on which he had been working for several years and which could well have led to breaking new ground in Pure Mathematics. A versatile linguist, Baba knew several Indian and European languages, had a fine library which needs to be protected and utilised, and a good collection of microliths and megaliths. He loved his dog Catya and later Bonzo and they went out for long walks together.

Published volumes of Baba's works include *Exasperating Essays*, *Myth and Reality* in which he deromanticised the Bhagavad-Gita, and *The Culture and Civilisation of Ancient India in Historical Outline*. But what was he like as a man?

He could be difficult, arrogant, sharp, blunt, aggressive, uncompromising, but also very gentle, with a breezy personality. He applied exacting standards to himself and wanted to extend it to others, but this does not work. There was no false modesty about him, yet he did not lack the essence of true humility. He believed in calling a spade a spade, which often got him into plenty of trouble, but he was not vindictive. He was relentless in his search for truth and no armchair scholar, as he believed in hard field work, which meant trudging long hours under the blazing sun, looking for archaeological finds or primitive survivals, to fill the gaps in recorded history.

Although the window of his mind was wide open, he could be dogmatic and intolerant, sometimes one-sided, with a tendency to put ideas into water-tight compartments. But he had an encyclopaedic, precise mind, with a flair for original research, which kept extending the boundaries of knowledge. Hence the importance he attached to methodology, yet at times the methodology tended to become an end rather than the means.

Baba did not know how to relax, he was a tireless worker, talker, questioner. He was more exhausting than exhausted but listening to him was a rewarding, stimulating experience, even if one did not always get a chance of being listened to. He never lost his trace of an American accent, but that is where the resemblance ended. His only relaxation used to be a weekly Chinese lunch with his friends in Bombay, including visiting friends, which he used to enjoy immensely and look forward to with youthful enthusiasm. He spoke fast and swallowed his words, -because his mind moved faster and it was not easy to keep up with him. He did not suffer fools and humbugs gladly, but had a devastating sense of humour which spared nobody, not even himself. Once, at the Tata Institute of Fundamental Research, he introduced an eminent but portly visitor with the words--"Meet the expanding universe in person". A friend could take liberties with him, but if anyone else did, there was immediate trouble. He was no respecter of persons, but his own respect could be won and held. He tended to bully, but could also be bullied by affection and trust. He made enemies faster than friends, but he was loveable to his friends and a real friend in need who put himself out no end.

As an individual, he had the courage of his convictions and a high standard of integrity, was intensely human, with natural compassion for the fellow human being, especially for the underdog,

but with no patience for the callous, the insensitive, the selfish and the unscrupulous. From the way he used to talk of his two daughters and they talked of him, he must have been a loving father, and I know what a good son and brother he was, never sparing himself. He was a strong individualist and much better working on his own than with other people. In his character and intellectual power, in his child-like quality and absence of childishness, he was outstanding. He was not known for his tact nor for his manners, yet he could be more concerned and considerate than most people. He made it easy to believe in him when it was so much easier to be let down, and was meticulous in meeting his obligations.

There was nothing in the world that did not interest Baba, yet perhaps a greater feeling for the creative arts could have softened some of the sharper angularities of his dominant, vibrant, human personality. He was friendly with everyone on the Deccan Queen, on which he travelled daily between Poona and Bombay and sometimes did his work. He suffered for his political convictions because he did not take the trouble to hide them, and it pained him to find scholarship being judged by political instead of academic standards. Baba was incorruptible and put principles above personalities, may be that is why the personalities were not too kind to him. It is left to posterity to do justice to his memory in a worthy manner.

"Baba" of Harvard Days

Lawrence B. Arguimbau

ARCUIMBAU, LAWRENCE B. (b. Brooklyn, New York). Between high school and college worked as student assistant in Bell Telephone Laboratories. Like Kosambi, took mainly graduate courses at Harvard, in his case in physics and Mathematics, graduating in 1930. **Did design** work on early radio instruments and from 1939-1954 radio research and teaching at Massachusetts Institute of Technology, as associate professor. Returned to industry designing **EM** radios and later audiometers. Author of two college textbooks (one reprinted in Japan, and in India), a mono- graph and many technical papers, (one in the Journal of the Madras Institute of Technology, November, 1953). Became interested in politics in the 30's during the depression, re-activated by the present college generation. Has been hybridizing flowers using colchicine to double the chromosomes. Has maintained a correspondence with former M. I. T. Indian students. Lives in a farmhouse in Lancaster, Mass. *Address:* R.F.D. 1, Box 410, Shirley, Massachusetts 01464 (U.S.A.).

One's life pattern can often be foretold from early days and so some idea of Professor Kosambi's college years may be of interest to those who had the pleasure of knowing him in India. The writer has never been able to visit India, though it was for a long time his dream to work there. When Professor Kosambi visited the United States in 1948 it was a pleasure to find him the same "Baba" that was known to us in Cambridge twenty years earlier.

Baba's father (also a Professor Kosambi) was on the Harvard faculty for several years and during that time the son attended the Cambridge public schools and became a well-rooted member of the "town." Although of course not a Christian he was very fond of the people around the Central Square Young Men's Christian Association, many of them his schoolmates, and regularly used its gymnasium, cafeteria, and movie house in preference to Harvard Square institutions. There is always a certain tension between the allegedly wealthy students of the "gown" community and the children of factory and office workers, the "town." Baba belonged to both camps but was perhaps most at home in the "town."

Years later when Baba visited Cambridge he looked up his old friends at the "Y" and he was deeply touched when a group of them formed an evening party for him and took him to see the "Icecapades." This was I suspect a greater honour and pleasure to him than almost anything else he received. It was a recognition that he was one of the Cambridge *people*.

From 1928-1930 Baba was one of four of us living in unheated rooms in the top floor garret of a Cambridge rooming house, 10 Trowbridge Street. Baba's room was at the top of the stairway with a sloping ceiling and single window, overlooking the backyards of apartment houses. The only decoration I remember was a photograph of Gandhi whom he deeply revered. The room was lined with book-shelves filled with the widest imaginable variety of things. I recall *Allgemeine Sprachenkunde* (a book on linguistics), copies of the Bible in Latin, Creek, German, and other languages (which he liked to compare as language practice), a large number of paperbacks of French, Italian, and German literature, as well as books in Indic languages, and of course scientific books, mostly in German.

A little story is worth telling about his interest in languages~ One spring he received a letter from his father (now back in India) complaining that Baba had only received 3 A's and a B. He suggested that if he didn't do better he was wasting his time and perhaps should return to India. Now for any ordinary person 3 A's and a B was an enviable record but not for the elder Kosambi. Baba was terribly upset and decided to remedy things. He had never studied Italian and decided to take the elementary course in summer school. He was required to read selections from a choice of two of four student editions of Italian literature. Instead he acquired all four full-length versions and studied them thoroughly. At the end of the course he received a note from the instructor saying that this was the first time in his career as a professor that he'd had to give the grade of "A+". The note was duly sent back to India without comment. One evening that fall I noticed Baba in animated conversation with a student in his room and later asked him about it. "Oh, he was working on his doctorate thesis on Dante and I was advising him about it."

On the other hand, I was taking a graduate course in atomic physics and in connection with it commented to Baba on a relatively obscure article by Einstein on the Bohr atom that I'd read in a German periodical. Baba was a math-student and had not taken even the sophomore course in physics. Much to my surprise he was not only thoroughly familiar with the Einstein paper but referred me to other Einstein work on related topics.

As an undergraduate Baba took a so-called "20" course of personalized student research from the late Professor George Birkhoff and worked on the multi-body problem. Kosambi held Birkhoff most highly among his teachers and was bothered that Birkhoff urged him to spend a larger proportion of his time on mathematics. When asked for advice his father backed Baba up saying he was pleased to see him develop the widest possible interests.

On the personal side, Baba was a fine companion going on long walks along the Charles River bank in a region that was then in a wild state or eating in the cheap little restaurants in the "town" regions of Cambridge. After the stress of an exam period we liked to go to the YMCA movie house and see a Hoot Gibson western as a piece of comic relief, or the four of us would play a raucous and jolly style of bridge, more banter than game. Perhaps the most innocuous, insipid reading of the time was in the mass-circulation *Saturday Evening Post*, and at times Baba would like to relax with

it at his stall in the Widener Library, of all places. To be sure, Hoot Gibson was diluted with, for instance, Fritz Leiber's Shakespeare, Alexander Moisei's version of "Das Lebende Leichnam," "The End of St. Petersburg," the Harvard-Radcliffe Christmas carols. When the Boston Symphony was in Cambridge, Baba could be found waiting on line for the 25-cent seats in a little balcony high over the stage.

From the time Baba left Cambridge we were out of touch for about ten years, when I happened to notice an American magazine article by him giving his address and we opened a long and frequent correspondence until a short time before his death. It was also a pleasure to establish friendship with two of his students, one of them his nephew, so I felt a greater sense of nearness to him than would otherwise have been the case at such a distance.

In 1948 I received word from him that he was coming on a visit to the United States on behalf of the Indian government. It was with a slight misgiving that I went to meet him at South Station. By then we were middle-aged. Would he after all prove somewhat pompous and on his dignity dressed in finery and staying at fashionable hotels? It was with intense pleasure that I saw the old Baba with superb physique striding up the platform in a simple business suit and carrying an enormous canvas knapsack strapped to his back ! We spent long hours discussing the past and the ills of the world. On Christmas Eve he helped my children decorate the Christmas tree--his first experience with that particular job.

During his student days one of his close associates was "young Wiener," son of his father's colleague, Leo Wiener. By the time Kosambi returned, young Wiener had become the international celebrity, Professor Norbert Wiener of M.I.T., who in those days spent many hours in my Tech office flopped in an easy chair talking about Cybernetics, radio engineering, Norbert's own science-fiction attempts, world politics, the BOMB, or perhaps the prices of motels or the dialects of my family's native island of Menorca. When they met again Professor Wiener greeted him with "Welcome, wise man from the East"--Professor Kosambi replied, "No, a wise-guy from Cambridge." I suppose I may be one of the few people who was close to both of these men. Except for physique they were strikingly similar. Both had interests as wide as the world. Both were professional mathematicians. Although I am not at all competent to judge their professional achievements, as people they impressed me as being quite similar in intellect and ability. Both had been friendly with fellow students from China and maintained life-long interests in that country. Both were authorities on scientific and cultural affairs entirely outside of their mathematical specialities. Both were outspoken critics of war and social injustice, attitudes that were not always appreciated. Amusingly enough, both were astonishing linguists. They had a fine sense of humour and of the ridiculous, and for all their complex natures both had kept simple homely touches and love of people, Norbert of the newsboys of Mexico City and Baba of his Cambridge "town" friends. The world is the poorer for the death of these two men. Let's hope the students they have left behind will carry on their work and ideals.

4 Notes. and Reminiscences about Prof. D. D, Kosambi

B. K. R. Prasad

My first meeting with Prof. Damodar D. Kosambi was during October 1919 at Cambridge, Mass, USA, where he was a young student of the local Grammar School. He was staying with his father, Prof. Dharmanand Kosambi who was carrying on some special work on the *Visuddhimagga* of Buddha-ghosa, the ancient Buddhist scholar, under the auspices of the Department of Oriental Studies at the Harvard University. D. D. Kosambi was about twelve years of age at that time and showed signs of a bright and keen intellect. I had gone to the Massachusetts Institute of Technology for post-graduate studies in Electro- technology and the application of electric power for Electro-Chemical and Electrometallurgical industries. I was introduced to Prof. Dharmanand Kosambi through Prof. Comfort A. Adams, the well-known Professor of Electrical Engineering at the Harvard University.

Young D. D. Kosambi used to ask me questions on various topics of scientific interest and also on sports and athletics whenever he happened to meet me. As he was a "Boy-Scout" in the Cambridge branch of "Boy-Scouts of America" and as I was also taking part in their Scout activities as a Scout-Master from Bangalore (India), I used to meet D. D. Kosambi in Scout meetings and in Scout camps on the country side. Swimming, hiking and exercises in the YMCA gymnasium as well as skating in winter time used to interest him to a great extent. In general he used to like outdoor life and developed a very good physique. He mixed with his fellow students and due to his very good record in studies and sports and athletics he became very popular with them. After a brilliant record in the Grammar-School he joined the Latin High School at Cambridge for his secondary education, and kept up his keen interest in mathematics and science. After completing his secondary school Notes and Reminiscences about Prof. D. D. Kosambi education he entered the Harvard University for college studies, with a view to qualifying for the engineering profession.

After 1922 his father returned to India and made suitable arrangements for his son to complete his college education at Harvard University. Young Kosambi seems to have preferred to study mathematics instead of engineering and pursued his studies accordingly under Prof. Birkhoff of the Faculty of Mathematics. During the latter part of 1924 he came back to India to see his mother whom he had not seen for about six years. Incidentally he visited his uncle and other close relatives in Goa. He took a keen interest in the development of the ancestral farm lands of his father and also in the future possibilities of exploiting the mineral resources of Goa and harnessing the water power at Dudhsagar Falls in Goa near Castle-rock. He got acquainted with the work that his father was carrying out at the "Purattatva-Mandir" of Gujarat Vidyapeeth which was being organised under the guidance of Mahatma Gandhi on the outskirts of Ahmedabad near the then famous Sabarmati Ashram. He got acquainted with Acharya J. B. Kripalani who was the Principal of Gujarat Vidyapeeth, and with Muni Jinavijayaji, a Jain Guru who was also associated with Pur~tatva Mandir and was a close friend of Dharmanand Kosambi. Besides these cultural contacts, D. D. Kosambi spent some time hunting in the jungles of Goa and the Deccan plateaus.

As he was in India for a few months his father wanted to ascertain the possibilities of his completing his under-graduate studies in the University of Mysore or Bombay, and then go back to Harvard for post-graduate work. But due to the rigid regulations of the Indian Universities at that time which did not provide for the transfer of undergraduate students from USA to the corresponding courses of study in India, young Kosambi had to return to Harvard to resume his studies. However, the short stay in India at this juncture was very useful to him to get acquainted with the state of agricultural and industrial developments in India and to re-orient his mind and temperament and to develop an outlook that put him in a better position to serve the people of India.

After returning to Harvard Kosambi completed his studies with great distinction and graduated with high distinction-- "Summa Cum Laude" and was elected to the fraternity of "Phi- Beta-Kappa" at Harvard University. Besides his professor Dr. Birkhoff he was in contact with other distinguished mathematicians like Prof. Dr. Norbert Wiener of M.I.T. of Cybernetics fame, and his other colleagues at M.I.T. and Harvard. During the latter part of his stay at Harvard his father was again called by Dr. Woods of the Oriental section of Harvard in order to complete the special work of editing the *Visudimagga* of Buddha-ghosa. This was a very welcome reunion for both father and son and they made the best use of it for each other's professional studies. Young Kosambi kept up his interest in physical culture including swimming, rowing and exercises in the gymnasium and also scouting as well as long-distance hiking. He returned to India in 1929-30 after the return of his father in the previous year. Before looking out for a suitable teaching position he stayed with me for a short while in Bangalore. On my suggestion he explored the possibilities of securing a position in the University of Calcutta and Benaras Hindu University where he could meet several friends of his father. In the meantime I learnt about a position advertised for the faculty of Mathematics at the Benaras Hindu University and advised Kosambi to contact them. He was offered the position immediately which was suitable for his qualifications. Thus began his brilliant career as an able professor of Mathematics. He made his mark there and built up a school of advanced studies in Mathematics. A group of brilliant students took up research under his guidance and contributed much to the developments in mathematics in India. Later on Prof. D. D. Kosambi was invited by the Aligarh University to their Faculty of Mathematics as the Head of their Mathematics Department. Here also he applied himself with the same keen and active spirit and made very valuable contributions in higher mathematics. Due to his keenness for scientific work and a cosmopolitan outlook on University education and Campus life, Prof. Kosambi became very popular among his colleagues and his students. The Vice-Chancellors of both the Universities highly appreciated his work and were very reluctant to let him leave them.

There was a call for Prof. Kosambi from the Fergusson College at Poona where his father was a Professor of Pall several years ago before he was called to the Harvard University in the USA. Here again he was very successful in raising the level of teaching mathematics to the highest standards. While here, he came into contact with a wider sphere of Mathematics as he got into close touch with the Indian Mathematical Society which included very eminent mathematicians from the Universities of Bombay, Mysore, Madras and Calcutta. He was called to serve on the Board of Studies in Mathematics of the different Universities of India. He also took part in Extra-Curricular activities in Poona by way of welfare works among the rural populations Notes and Reminiscences about Prof. D. D. Kosambi near Poona and outskirts. He developed interest in the study of Indian History as ascertained from archaeological discoveries and ancient coins.

About the middle of 1943-44 Prof. Kosambi was invited by Prof. H. J. Bhabha to take up the Chair of Mathematics at the newly established "Tata Institute of Fundamental Research" at Bombay. Here he found a much wider field for mathematics as it had a very important contribution to make in the researches in Atomic energy in India. He had a number of workers keenly interested in the mathematical developments which concerned the latest methods of solving intricate problems in nuclear physics and atomic energy. During his association with the Tata Institute of Fundamental Research Prof. Kosambi stayed with me as I happened to be associated with the Hydro-electric developments in Bombay state. For some time in the earlier days he used to commute daily from Poona to Bombay. But as this proved to be very tiresome he stayed with us for five years during

five days in the week and went to Poona over week-ends, as Mrs. Kosambi and their children were staying at Poona. This system was rather strenuous for him and it must have adversely affected his health to some extent.

During these years Prof. Kosambi took a keen interest in the activities of the Council for Peace of the World. On their behalf he undertook several visits to Europe (Western and Eastern) as well as to USSR and China. In the Mathematical field many of his papers were published in reputed journals abroad. In 1948- 49 he was invited as an Exchange-Professor by the University of Illinois, USA at Chicago for an academic year and his work there was well appreciated. He was also invited by the Institute for Advanced Studies at the Princeton University for about two months. Here he had a few important conferences with Prof. Albert Einstein regarding his latest work on "*Relativity*" He renewed his contacts with his former colleagues and friends at the Harvard University. Although he enjoyed his academic work at these seats of learning, he was somewhat disappointed with the steady deterioration of the cultural life in USA caused by the Second World War and the lack of appreciation for real values of life in general. He observed the conflict between liberal ideas of socialism and liberalism on the one hand with the conservatism of capitalists or diehards on the other hand. His work at the University of Illinois was so well appreciated that he was invited by the Harvard University to take up an important teaching and research assignment at their faculty of mathematics. But as he had to resume his work at the Tata Institute of Fundamental Research, Bombay, he politely declined the offer with regrets.

Another venue of his activities was at the Bhandarkar Oriental Research Institute in Poona, where he associated with some well-known Sanskrit scholars and Vidwans. Here he edited the works of Bhartrhari and later published Vidyakara's *Subhasita- ratnakosa* in the Harvard Oriental Series. The authorities of the British Council who had opened a chain of modern libraries in India arranged for a series of lectures by him on Indian History and Culture at some educational centres in England, which were very much appreciated. While in London he renewed his contacts with his cultural friends there among whom may be mentioned Prof. Bernal of the Physics faculty of Birkbeck College. During recent years he had planned another visit to Europe in connection with his researches in mathematics. But as ill-luck would have it, he could not carry out this plan of his. His former colleagues and students have highly appreciated his works as a brilliant mathematician and a research worker of high calibre.

5. Tramping with Kosambi through History

Maj. Gen. Habibullah

HABIBULLAH, E. (Maj. Gen.): Passed out Of Sandhurst in 1930 and was posted on the North-West Frontier of India for fourteen years where he saw active service as also later in Africa and Burma. He commanded the National Defence Academy at Dehradun and founded the new Academy in Khadakvasla. In the literary held, he translated some technical books pertaining to armoured fighting vehicles from English into Roman Urdu for the Indian Armoured Corps. He was in Malaya as Deputy C-in-Chief of that country's army for a brief period. In 1981 he retired. Horses are his absorbing hobby. Major General Habibullah has taken to writing reviewal critiques and articles for journals. *Address:* 11. Mahatma Gandhi Marg, Hazratganj, Lucknow, Uttar Pradesh 226 001.

There are some persons who when they walk across the stage of life leave something of an aura, a presence, for which those who have the good fortune of being in their proximity are the richer for it. D. D. Kosambi was one such rare individual who strode across the great screen of human wisdom in all too rapid strides. Being an amateur archaeologist myself, I had been looking for some wise

man in Poona, which is full of wise and simple men by long tradition. I was given several names but most people spoke specially of Kosambi and Sankalia. It was, therefore, by the rarest good fortune that a very good friend in Bombay turned out to be so good a friend of the Professor that he offered to bring us together. I like to think that Kosambi was also aware of my existence before that date, for, from the first moment of our meeting we became the best of friends and our friendship grew. He was said not to be an easy person to get on with; but that was, probably because, though he could suffer fools to some extent, the humbugs he could not for a single moment. He had a rich vocabulary which he could make use of with his Harvard American twang!

I did not waste time in seeking his help to found an archaeological Society in the 'hobbies' section of the National Defence Academy. Nor did Kosambi hesitate in taking on the job. I had been told he might hum and haw; to my joy he did not. From then on I cannot say whether the Chief Instructor (Army) or I was his more ardent student. Being the more senior, I left a good deal of the detailed follow up to Colonel 'Monty' Kee, as Irish as an Irishman could be, for whom Kosambi developed a great liking. Between us and under his guidance we soon had a thriving society with a band of real young enthusiasts. The first thing we did was to establish an archaeological museum to Maj. Gen. Habibullah which he gave some very rare microliths. So magnetic was Kosambi's personality that we had to limit the number of volunteers who flocked to him. It was a pleasure to watch the flame of knowledge kindle and grow in these young minds; hypnotised by the sincerity, the wit and the sharpness of the Professor's genius. "See that step-like effect there. That is a sign of early cultivation before ploughs were used" he would say as though everything was obvious. "Look at that hill with a lone tree on it. I am sure you will find pre-historic remains of worship there" or "Do you know Junagad means old, i.e. 'Jirna' Nagar?" or "Oh yes, that inscription is in 'Brahmi' script, it must be such and such period which is confirmed by the use of this letter. This sort of letter is not found after such and such date."

When he was in the field his eyes worked like those of a hawk. The most ordinary chips, rocks, ruins or carvings would have a meaning. He could as easily and quickly reject too the bogus or imitation. An ordinary annual festival at the temple near the Karla caves led to his discovery of a very ancient rite performed, before the Kolis took to fishing. He followed it up by showing how a goddess there being married to a god in the interior, had an old trade route significance. "Therefore," he said, "this is such and such place, mentioned in such and such writing in such and such century." There was never a doubt, for he would sum up facts and use them so very clearly and conclusively that there was never room for doubt.

Kosambi's father was a great student of Buddhist life and culture. This study the son had developed in great measure, and his economic theory on the situation of cave colonies proved to be fantastically accurate. He discounted the theory that caves were situated "away from the madding crowd." In fact he said, their location depended on (a) proximity to trade routes, (b) halting places of caravans or pack trains. "Therefore" he- said "they should be a day's march (or measurable by days marches) apart, which should be between fifteen or twenty miles." Projecting his theory we marched towards a group of caves near the sea at Kuda. To our amazement, we came upon a huge group at Karsambla lost in a forest at the foot of the Western Ghats below Bhaja. These had once been recorded in the 1880s in some official files as "probable"; but no one knew of their context or extent. In rummaging, through the ruins we found evidence of frescos and decorations that must have made Ajanta look provincial. We found Brahmi inscriptions of which he made us take plaster casts. As we proceeded he explained that being exposed to weather they had deteriorated all the

more rapidly. Fifteen miles into the plain, there was a hamlet with roads leading to four important ancient areas including two important passes up the Ghat. Two marches away was Kuda itself!

His mind was always active, always probing and almost always original. His independence in thinking brought him face to face with many an intellectual giant; but nothing daunted him; for his intellect too was gigantic, unique. He had the most amazing tenacity and, so single minded a sense of dedication, that his own physical wants rarely stood in the way of his true and scientific approach. Yet his family life was traditional, warm and close. His house is a typical Maharashtrian middle class dwelling, filled with rare books. A glance at his well stocked shelves shows the versatility of the mind that dwelt in the Professor's physical frame. I was taken aback to see in a foot note, that he had provided the most vital missing link in the historian Robert Graves' researches on the life of Christ: Kosambi had translated some rare Sanskrit documents which had been deposited in the Srinagar Fort since their removal from Tibet by Zorawar Singh. Robert Graves quotes with respect and without hesitation the interpretation of these documents which prove the presence of Christ in Kashmir.

Though he loved Sanskrit and quoted it fluently, mouthing verse after verse with obvious relish, he could translate from Latin, Greek, Pall and Arabic well enough to be able to decipher and extract meanings on the spot. He was in search of megaliths in the Poona area at the time of his demise. He had already drawn many conclusions, relating the Deccan to Central Asia in pre-history. His mind was amazing at grasping details. I often wondered what a marvellous General this stout-hearted, rugged devotee of science and progress would have made, had he so chosen.

Internationally, he was exceptionally well known and much sought after; but he was shy and never went out of his way to seek publicity or fame. This may be why so few knew him and very few knew him well, but so many admired him once they had made his acquaintance. I remember a very intelligent General reading his smaller history book and saying "I wonder who this man is. What a fund of knowledge and what masterly writing!". Yet Kosambi could sum a man up in one meeting; and he put people in 'White' and 'Black' categories at once. There were few grays for him.

Kosambi's impact on others, I am sure, tended to impress itself on those with whom he came in contact. Speaking for myself, it had a tonic effect. India, the Deccan, the human race seemed to take on a new meaning. Stones could be made to yield secrets of history, time could be filtered down to give interpretations to ancient texts; hope and insight seemed all-pervasive. What a varied and wonderful thing was society. What changes and turns had the histories of men and groups suffered, and how had the main stream of generations resisted the storms of changing fortune in history! All this, one could perceptibly feel when in proximity to him. Yet he was a recognized mathematician among the highest ranking mathematicians in the world and he could take even laymen into the world of numbers and make them seem to be thrilling and alive. He was a statistician of international repute.

Yes, Kosambi was a rare human; humanistic in the extreme, compassionate, humble with the humblest and a giant among the proudest giants. That was the man I, and many of his friends, had the good fortune to know during an all too short life. His loss to us is great; how great has been his contribution, only future generations will tell. He was a rare aroma in the garden of man's achievements. He was not "the stuff that dreams are made of" but the solid earthy stuff on which the future of man is founded.

6 D. D. Kosambi

J. D. Bernal

BERNAL, JOHN DESMOND, M.A. (Cantab.); F.R.S. (1937) Royal Medal of the Royal Society 1945; Lenin Prize 1953; Prof. of Physics, 1937-63 and Professor of Crystallography 1963-68; Birkbeck College, London. Various scientific papers on Crystallographic, Physical and Biochemical subjects; and contributions on scientific, philosophical and social sciences *Address*: Birkbeck College Research Laboratory, 21 Torrington Square, London, W.C.1. (England).

The death of Professor D. D. Kosambi on June 29, 1966, at the age of fifty-nine removed a unique figure, not only from India but from all society.

Kosambi had a most unusual and comprehensive education, partly in the United States, at Harvard, where his father taught Indic studies. He acquired early an interest in mathematics, which was his main contribution to science, particularly in the field of statistics and Stochastic Theory. This put him in the front rank of practical mathematicians and his interest was then transferred to theoretical and nuclear physics and he worked on fundamental research at the Tata Institute in Bombay under the general direction of the late Homi Bhabha.

I am not qualified to comment on his mathematical work, especially as much of it is concerned with number theory and calculus of variation; but I had a great deal to do with him as a man of quite exceptional intelligence and charm, particularly in the work concerned with the Indian peace movement, and I learned something of his wide scope of interest. Although trained in the United States, he remained from the very beginning mainly concerned with Indian problems, including Indian economics, history and archaeology. It was a pleasure to travel with him in his own country because, for Kosambi, history was not only in the past but also in the present.

In the extremely unsatisfactory records of Indian history which he has denounced in his books, he finds the preservations, of beliefs and customs in many tribes and castes. He finds, for example, not only the places of worship but also actual names, such as that of the goddess Lumbini presiding over the birth of the Buddha, which has been preserved locally practically unchanged for 2,500 years. I witnessed one of these survivals myself outside the National Chemical Laboratory near Poona. It was a newly established shrine with a crude figure smeared with red paint and an attendant ascetic who, for a consideration, would offer up a prayer so that the new arrival into the laboratory could be assured of a good post.

Kosambi's interest stretched further than the geography of India. I accompanied him to the National Museum of Denmark in Copenhagen and he was able to tell the curator precisely what bones he would find at the bottom of a well because the Bronze Age Danes had the same horse sacrifice as the ancient Aryans of India.

Wherever he went he was able to trace out the early trade routes still in use in the age of steam and motor cars, and often transporting the same goods including pots made with the slow and fast wheel, that had already been made in the Indus civilization in the second millennium B.C. For this he had also to perfect his knowledge of Indian languages and poetry. His father knew the whole of the *Pali Tripitaka* by heart, and I remember Kosambi taking me to the Institute in Poona where a number of aged Indian scholars and their younger disciples were occupied in providing a comparative edition of the *Mahabharata* of 100,000 lines from numerous manuscripts on palm leaves and other fragile bases, reckoning that they had done a good day's work when they had completed one line!

Kosambi introduced a new method into historical scholarship, essentially by application of modern mathematics. Indians were not themselves historians: they left few documents and never gave dates. One thing the ancient Indians did leave behind, however, were hoards of coins. These carry no inscriptions which list kings or date markings, but they had been in circulation before the hoard was buried and had suffered varying degrees of wear before burying. By statistical study of the weights of the coins, Kosambi was able to establish the amount of time that had elapsed while they were in circulation, and so set them in order, and to give some idea of their respective ages. In this way he was able to date these coins known as punch- marked coins, weighed pieces of silver of carefully standardized weight marked with various devices which connected them with a definite king, sometimes many with a single king such as the great Asoka of the Maurya dynasty. The persistence of a coin is one of the most remarkable of human characteristics. In his book, *The Culture and Civilisation of Ancient India in Historical Outline*, Kosambi shows a picture (No. 62) of a coin of a Greek king, Menander, in North India, 180-160 B.C. which he found in 1940 circulating in an open air market in Poona as an equivalent of half a rupee.

His great contributions to historical science have been his two books *Introduction to the Study of Indian History* (Popular Book Depot, Bombay, 1956) and *The Culture and Civilisation of Ancient India in Historical Outline* (Routledge and Kegan Paul, London, 1965). These provide a history of an entirely different character to anything seen before. As he himself says in his latter book:

"But what is history? If history means only the succession of outstanding megalomaniac names and imposing battles, Indian history would be difficult to write. If, however, it is more important to know whether a given people had the plough or not than to know the name of their king, then India has a history. For this work I shall adopt the following definition: *History is the presentation in chronological order of successive changes in the means and relations of production.* This definition has the advantage that history can be written as distinct from a series of historical episodes."

In his second book, Kosambi certainly bears out his definition. He shows a picture of a two-bullock plough of the same characteristic type with vertical handle and curved yoke-pole, taken from a relief of the Bodhisattva's First Meditation in the Buddhist caves at Junnar, as in use in A.D. 200 and still in use there at the present day. They are, for all practical purposes, identical.

A great deal of Kosambi's book is taken up with the description of classical Indian political science. The *Arthashastra* is a complete and almost Machiavellian description of how the great Indian state of Magadha (300-184 B.C.) was ruled and how the institutions of the complete police state could be adapted to the tenets of the purest Buddhism. He shows that the positive task of the Mauryan State consisted of opening up the territory of the Ganges Valley, including Bengal and even Assam, by

clearing the tropical forests and assimilating, through institutions of Hindu religion, the local populations.

All this may seem very far away and long ago, but to Kosambi it was all in the present as well, illuminating the current difficulties of Indian agriculture and industry.

"When gunpowder had blown Arjuna's bow and later feudalism off the map the Indian intellectual still turned instinctively to the (Bhagavada) Gita to find some way of coping with patriotic needs in the new world of banks and shares, railroads, steamships, electricity, factories, and mills.... The Gita is honoured oftener than read, and understood far less than it is recited. After such mixed ideas are displaced by clear-cut thinking based on a firm grasp of material reality, the work may still furnish some aesthetic pleasure for its power of expression and peculiar beauty."

7 The Late Prof. D. D. Kosambi

H. D. Sankalia

SANKALIA, HASMUKH, DHIRAJLAL: Fellow, Jawaharlal Nehru Memorial Fund ; Hen. Head. Department of Archaeology, Deccan College, Poona; **M.A., LL.B.** (Bombay); Fh.D. in Archaeology (London), Honorary Tagore Professor of Humanities, M.S. University of Baroda, 1963, Presided over First Maharashtra Itihas Parishad, Bombay, 1965, Author of *An Introduction to Archaeology*, 1966 and *Stone Age Tools, their techniques, and probable functions*, 1964, Joint Author: Reports on Excavations at Kolhapur, 1952; at Nasik and Jorwe, 1955; at Maheshwar and Nadvatoli, 1958; at Nevasa, 1960; at Ahar, Udaipur 1968; at Nadvatoli. Address: 'Satchidananda', Deccan College, Poona 411006.

This article is in the form of reminiscences of my contacts with the late Prof. D. D. Kosambi. I came to know him first in 1941 when I shifted from the Deccan College Campus to the Jangli-maharaj Road. At this time viz. in 1942 I had just returned from the First Gujarat Expedition and I was invited to give a lecture on the Foundation Day of the Bhandarkar Oriental Research Institute. For some reasons, Prof. Kosambi could not attend this lecture. And when he met me sometime later, he told me how sorry he was for his inability to attend my lecture. Later he came to my house with some reprints of his articles and before taking leave of me, he invited me to go to his place, and when I went on the following day, he was *very* kind and hospitable and he almost forced me to have some refreshments which I was not used to. And from then on for a number of years we used to exchange our reprints, the most common subject being coins on which he had prepared a very interesting and original article by weighing the coins. By a careful examination of the coins, he found out how the statistical approach could be made use of to find out their age. So when I happened to acquire a similar hoard of punch-marked coins from Nagari in Rajasthan in 1955 and published the results in 1956, I sent him a copy of the article. He said that the hoard was welcome because it gave us a large number of punch-marked coins in the graded series, though they were not useful from the statistical point of view. And then I realized how very ignorant I was of the statistical method, because I thought that this hoard would be as precious as the one studied by Prof. Kosambi, viz. of Gupta coins.

Then came a period of estrangement. How this estrangement took place, I do not know. Prof. Kosambi began to criticize our excavations (without meaning me or my colleagues specifically). So

when I met him in the Deccan Queen after several years I went out of my way to meet him and ask him why he had taken such an antagonistic attitude. He then said that somehow or other he could not understand our report on Maheshwar and Navdatoli nor did he agree with my interpretation of the evidence, viz. on the Chalcolithic culture at Navdatoli which I said belonged to a Puranic phase of our history. Prof. Kosambi was always a very difficult person to convince and he went on pursuing in his attitude and this came out in a most violent form when he criticized my book *Prehistory and Proto-history in India and Pakistan* in a severe way in the *Times of India* (1964). Immediately I wrote to him that the review was quite unfair because the book was an exhaustive survey of all that was known and it was--more than 60 to 70 per cent based on the original work done at the Deccan College and also other unpublished works. To this he did not reply. Then I also invited him to pay a visit to our Institute and see our museum and the work done by us in the Institute. To this also he did not send me a reply. After a couple of months or so, he wrote to me saying that in the heat of the argument, he forgot to write about the work he was doing on some problem and wanted to know whether he could visit our museum and take some photographs. He particularly mentioned that he must have full liberty to handle things and take out objects as he pleased. I said that the entire museum was at the disposal of scholars like him and that there would be no restriction on his handling or photographing any material. When he came to the Department, I showed him all our pottery, stone tools, particularly the section on Nevasa. When he saw all our collections, he was indeed surprised at the way things were exhibited and the work done by the Institute and immediately asked me to allow him to photograph the Nevasa section. He also took photographs of the mother-goddess from Nevasa and elsewhere. Before he took leave of me, he took a colour photograph of mine saying 'Please tell your colleagues and friends that this photograph has been taken by one of my most severe critics.' Thus the visit of Prof. Kosambi ended on a happier note. But a still more happy moment was to come when we spent several hours together, almost the whole afternoon, in surveying all the megalithic monuments that he had discovered in the Poona District. He took us from one monument to another and went on explaining how he thought that these were prehistoric monuments, exactly like the megaliths of Mysore, Andhra and South India. He also thought that these in some way or other continued the tradition of the prehistoric or proto-historic cultures, etc. Here I must say that I had myself decided not to contradict him and also advised all my colleagues not to contradict him on the spot because this would have led to a very furious argument. In the first place we were seeing one of his most important life-works and therefore before any comments could be offered we had to understand his viewpoint and only then offer criticism.

Immediately afterwards he invited us to see the specimens of prehistoric carvings which he had collected and kept in his house and those which he had seen on the Vetral Hill. The latter could not be taken out, as they were in danger of being dynamited and he thought that I should use my influence and protect them from further damage. So my colleague Prof. S. N. Rajguru and I with one or two other colleagues went to him one day in the early morning at about 5.30 a.m. Unfortunately, it was on that very day we heard the shocking news of the death of Sri Lal Bahadur Shastri at Tashkent. Still both Prof. Kosambi and myself were made of such stuff, that this news did not deter us from doing our job, and we spent 5 useful hours surveying in detail all the things that he had observed on the Vetral hill. And alas ! this was our last meeting.

Whether one agrees with his conclusions or not, one must admire the great tenacity of purpose and interest with which Prof. Kosambi had moved about in these parts of the Deccan and observed

things for himself.

8 Kosambi's Approach to Human Problems

A. R. Vasudeva Murthy

It is needless to say, that Kosambi is to be rated as one of the foremost among; the patriotic intellectuals of India. The contributions to this volume by learned scholars will offer enough evidence of this. The present note seeks to show, how Kosambi was free from all inhibitions in his intellectual pursuits. He would freely mix with all the cross-sections of the community to understand the human problems, as he was convinced that this was the first step to seek solutions for them. He became one with them while he was with them and made the people feel that there was no barrier of any kind between him and his fellow beings. A few incidents will illustrate this aspect.

He often visited his friends in the medical profession. If he had to wait for his friend and if there was a large gathering of patients who wanted minor treatments for their wounds and injuries, Kosambi would not hesitate to wash and dress the wounds even if they were found on the legs or head. He was fully equipped for this. He had taken good lessons in first aid and nursing. He fully made use of this knowledge to offer his services and made them feel one with him. He would often go to the villages regularly and run such "Medical Camps" not only to relieve the pains and sufferings of the people but also to learn more about them and their problems. He would not hesitate to "inflict" such treatments even on his own aged mother if he found it necessary, in spite of her protests, until the venerable lady would yield and say, "It is not worthwhile to resist Baba's bullying!". Kosambi did not sniff at the indigenous drugs or their treatment. Once he came to know, that a local massagist was preparing a kind of medicated oil which would give some relief to pain in the joints. He visited the "Institute", of the healer and bought a bottle of oil and tried it on himself first. When he found relief, he began to extend this treatment to hundreds of friends not only in India but also in Europe and America and other countries.

Kosambi was a frequent visitor to Bangalore and he was curious to know about many interesting features of Bangalore. One of the most popular festivals in Bangalore is "Karaga" which comes off on the full moon night during spring months of March-April. The main ceremony consists of a procession of 'Karaga' (decorated triple pot) carried by a male priest dressed as a woman. By careful examination of all the details of the rituals, he was able to show that this symbolises the transition from matriarchy to patriarchy. It took a number of years of patient observation and meeting priests of all communities connected with this ritual. He would approach the most orthodox Brahmin priest as politely as he would the priests of the so called 'low castes' and 'untouchables'. By such intimate and friendly contacts, he gathered the required information for his work from the existing society; he was as much at home with shepherds as with scholars.

While he was running the campaign: "Peace by peaceful means", he addressed hundreds of workers, students and scholars with equal enthusiasm and fervour. One of the elderly statesman and an important, respectable scholar in Bangalore expressed his desire to meet this "Revolutionary", although he did not approve of his philosophy. Kosambi heard about this and learnt that this elderly person was bed-ridden. Immediately he took a transport and went to see this invalid person. He sat beside his bed and first made kind enquiries about his health. The old gentleman burst into tears with joy when he learnt that the enquirer was no other than Kosambi whom he was longing to see

for nearly 2 decades. The sick man forgot his illness and *carried* on conversation with him for nearly 3 hours and it was Kosambi's consideration for the former's health that brought it to a close.

9 Some Personal Reminiscences of Prof. Kosambi

M. Raziuddin Siddiqi

The news of Professor Kosambi's death came as a great shock to me. I had not heard about his illness, and, therefore, did not know that he was so critically ill. It is an irreparable loss not only to the world of Learning and Scholarship but also to those who had the privilege of enjoying his warm and inspiring friendship.

I had known him closely since the early 1930s, and used to meet him quite often for a number of years. The Library of the Indian Mathematical Society was located in the Fergusson College, Poona, and as Secretary, and later President, of the Society, I had to go to that city very frequently. He insisted on my staying with him and was a most charming and thoughtful host. The late Vijayaraghavan also joined us there some time, and our discussions on these occasions were most stimulating and of absorbing interest to me.

When I first met him at a meeting of the Indian Mathematical Society in 1932, he had just launched on his researches in "Path Spaces", and had a close contact with some of the internationally well-known mathematicians, especially of the School of E. Cartan, who were working on the same lines. His reputation as a vigorous and outstanding mathematician was spreading far and wide. Other universities used to send their research scholars to work with him for their doctorate degrees. He was a most exacting teacher, and demanded the highest standard and consistent hard work from his pupils. I had to act as an examiner with him sometimes, and I could see how he pursued a candidate until he had extracted the last bit of information out of him.

He had no worldly ambitions, and preferred to work in the Fergusson College of the Deccan Education Society in Poona on Some Personal Reminiscences of Prof. Kosambi a nominal *salary* rather than take up a lucrative job elsewhere. I had wanted him to come as a Research Professor at the Osmania University on quite a high salary, but he was content with his life at Poona. When the late Dr. Bhabha invited him to join the Tata Institute of Fundamental Research, he was still hesitating and asked my advice. I was able to persuade him to join the Institute not because the emoluments were higher but because there was a better chance for him to do his own work and to train younger mathematicians there. Another argument in favour of the move was that the Institute was situated in Bombay so near to Poona, and he could visit his favourite residence regularly every weekend.

He was a versatile genius and could easily switch his mind from Abstract Mathematics to problems in Numismatics and Archaeology. The proximity of his home to the famous *Bhandarkar Oriental Research Institute* at Poona attracted many scholars of Classics and Ancient History to him, and they came to consult him on problems connected with research on the Ancient Civilization. Some of

his acquaintances thought that perhaps he was frittering away his energy on trivial problems unconnected with Mathematics. He was, however, satisfied that he was doing useful and worthwhile work, and a number of eminent scholars agreed with him.

Another trait of his character led him to wage a crusade against any injustice that he came across, and he championed the cause of the down-trodden with all his vigour and courage. He was absolutely out-spoken and was consequently not very popular with the higher-ups. He suffered for his convictions, and I had an impression from his last letters that he was not getting on very well with other people.

He was also a very keen reader of detective stories, and used to take them as a pastime for solving mysteries. His Reading Room was full of such books, and we used to compete with each other in unravelling the mysteries as quickly as possible.

One passion of his early youth which remained with him throughout the greater part of his life was the exercise in weight-lifting. He was a very strong man physically, and was in the habit of boasting to his intimate friends that he was the "strongest" mathematician of his time. This was, of course, implied in the sense of physical strength. We used to warn him not to overdo the exercise, and I have an apprehension that this habit had something to do with the damage to his heart which ultimately snatched him away from an active and vigorous life.

His place will be hard to fill, and all those who came in contact with him will feel his loss painfully. As a mathematician and as a savant, he has a secure place in history.

10. Extracts from the Tributes

W. Seidel

The late Professor D. D. Kosambi and I were classmates at Harvard University in the years 1925-1928. We frequently attended the same classes in mathematics and became good friends. Professor Kosambi, whom I called "Baba", impressed me deeply by the brilliance of his mind and the wide range of interests which he exhibited. He was a man of great personal charm and attractiveness.

I left Cambridge, Mass. after my graduation from Harvard to do graduate work in Munich, Germany, and did not see Kosambi again. However, we maintained contact through correspondence, and I was shocked to learn that he had left Harvard before obtaining his Ph.D. in mathematics there. This was the time of the market crash in the United States. As a result, academic positions became very hard to find, as I discovered on my return in 1930. The authorities at Harvard were in great difficulty to find positions for their graduates and Kosambi was discouraged from completing his studies at Harvard.

In spite of these difficulties Kosambi attained great prominence even in other fields, such as Indian archaeology. I shall always treasure my association with this remarkable man.

C. D. Deshmukh

As I can recall after about 25 years, it was as Governor of the Reserve Bank that I first met Prof. Kosambi. I presided at a lecture he delivered in Bombay on a horde of punch marked coins dug up at Taxila. The treatment was statistical and some- what novel in numismatics. I was highly impressed, not only by this side light of Prof. Kosambi's mathematical talents, but also by his transparently and uncompromisingly candid personality.

In those days I used to visit Poona quite frequently to see some very dear friends there and Prof. Kosambi and I often met in the train between Bombay and Poona and our acquaintance gradually developed into a somewhat uneasy friendship. Prof. Kosambi's intellectual interests were, I soon discovered, surprisingly wide, and his observations on men and things within this ambit were refreshingly frank. He was good enough to send me from time to time copies or reprints of some of his writings, that he thought would interest me. Those included his edition of Bhartrahari's *Satakas*, articles on rock caves in the Western Ghats region and an article on *Bhagvadgita*. This last was critical to the point perhaps of seriously angering Hindus, challenging as it did the conventional standing of the Gita, even in the eyes of Sanskrit Scholars of repute. From their point of view, it could even be discounted as Buddhist partisan sally against something regarded as very sacred by the Hindus. Of his major interest and profession, mathematics, he naturally did not say very much as I am no mathematician and could not share his professional interest.

After I left Bombay my contacts with Prof. Kosambi naturally grew much rarer, although we kept up a sort of long range friendship. His sudden demise was a great shock to me, as it must have been to his friends and admirers -- I am sure a very wide category.

Namdar Khan

Professor D. D. Kosambi commanded an unusually high respect among the student community at Aligarh which liked to interpret his initials 'D D' as 'Doctor of Divinity'. Athletic in appearance and magnetic in association, Professor Kosambi was a unique personality in the domain of Indian education.

Professor Kosambi as a Scholar

A man of versatile genius, had practically mastered a number of European languages including French, German, Italian and Russian. He could speak in any one of these languages almost as if it were his mother-tongue. He had enough knowledge of Greek and Hebrew also. I know it personally in as much as he used to quote from Greek and Hebrew in his classroom lectures.

He was a voracious reader and had a profound knowledge of European literature, history and economics. He was particularly conversant with the philosophy of dialectical materialism as propounded by Marx and Engels.

He had taken only a Bachelors' Degree in pure mathematics at the Harvard University and yet had a complete grasp over the latest developments of mathematical research in Europe. His knowledge of the subject was so sound and penetrating that it looked almost fundamentally different from what was prescribed in the curriculum for mathematics in the Indian Universities by the conservative system of education derived from the British.

His extensive reading and vast learning had made him a man of progressive views much ahead of his co-religionists. He was deeply interested in mathematical researches and the learned discourses he gave on history and economics in private conversation clearly established that he well deserved the title conferred upon him by the student community.

Professor Kosambi as Individual

Professor Kosambi was very simple in his habits; his dress too was very simple. I have often seen him in shorts in the market. He was often seen in the class-room in shirt and pant, with Peshawari chappal. At home he had no drawing-room or sofa-sets, but huge almiras full of books. He had a good appetite and enjoyed good food. In spite of his being a Brahmin he never hesitated in taking meat openly and even in the presence of his co-religionists. In Delhi, he always dined in Muslim hotels and he had taken a fancy for food cooked in a small hotel known as Shahjahanpuri hotel in Chandni Chowk near Fatehpuri mosque. He had told me, that in Delhi he could get the best food only in the Shahjahanpuri hotel and advised me to taste chicken and *Qorma* of that hotel. When in Delhi I did actually search out that famous hotel liked by Professor Kosambi and found that whatever he had said was absolutely true. In private, when he was alone with me he would like to talk in his mother-tongue Marathi. I seemed to be the only student in Aligarh who could speak Marathi with him. He was very fond of Marathi literature and whenever I quoted to him some relevant passages from a famous drama known as "*Ekach Pyala*" he felt exhilarated. He was a fluent conservationist and would hardly allow others to speak when he was talking. When his statement was contradicted he laughed heartily and was always ready to admit his mistake. He always asked me to recite Sanskrit poems of which I knew a lot and he would then start his philosophical discourses quoting Goethe and the German philosophers.

Professor Kosambi was nationalistic in outlook and was deeply convinced about the greatness of his own country. It was this that had brought him back to the sub-continent from America and he had joined Benaras Hindu University as a Professor of Mathematics. But as the atmosphere of orthodoxy, narrow-mindedness and complete indiscipline among the students that he found there was not palatable to his progressive views, he was thoroughly disappointed and his rebellious temperament was in search of a more free atmosphere and disciplined social environment. He was therefore planning to leave Benaras as and when opportunity permitted him. Extracts from the Tributes

Professor Kosambi as Teacher

During the regime of Dr. Boss Massed, as Vice Chancellor of Aligarh Muslim University, a French Jew by name Dr. Andreville was appointed as Chairman of the Mathematics Department. He was a very brilliant scholar of Mathematics, who had broken the record in the University of Paris at a very early age. On his arrival in Aligarh he was feeling like fish out of water. He went round India in search of men of his calibre and met Professor Kosambi and Dr. Raghavan in some conference in Calcutta. He persuaded both of them to join the teaching staff of Aligarh Muslim University and thus Prof. Kosambi came to Aligarh. Dr. Raghavan and Dr. Andreville were quiet by temperament and were always engaged in solving mathematical problems in the staff-room. There used to be a black-board in the staff-room on which the latest mathematical problems used to be written and the two professors used to sit dumb gazing at the black-board. As soon as Professor Kosambi entered the staff-room the atmosphere used to change suddenly. Looking at the black-board Professor Kosambi would start immediately in French and would rush to the Board in order to solve the problem. The two sitting professors would find themselves perplexed and would listen to the discourse of Professor Kosambi as students. He would immediately solve the problem giving references to French and German authors and the two professors used to be satisfied with the approach and solution of Professor Kosambi. Thereafter the two professors used to take out those books referred to by Professor Kosambi and start reading them.

In the class-room Professor Kosambi was very simple and would develop his topic from the very elementary principles of the subject. After explaining the preliminaries to the students he would create interest in them to understand the problem correctly. Professor Kosambi then was a gushing stream of knowledge. He was absolutely thorough and up-to-date in his subject. He would illustrate the most intricate problems of mathematics in a very simple manner always giving references to French and German authors.

Professor Kosambi in his zeal to impart knowledge was making an attempt to enliven the subject and its teaching by making it more utilitarian in its application. The knowledge of the students unfortunately was grounded on outdated knowledge of the subject and they were thus feeling uneasy in following him when he developed the topic on modern lines. Aligarh in those days was behind times in so far as this subject was concerned. But in the class his teaching was superb. His explanation of the fundamentals was illuminating; his treatment of the topic was analytical and full of references. With his nimble tongue and fluent speech the class-room used to be a highly entertaining place.

As teacher Professor Kosambi was conscientious. He was aware, that the subject he was teaching was very dry. He could sense when the students were likely to be bored, and then immediately he would introduce an entirely personal topic *e.g.* in reference to his own student days or narrate a story of some witty author that would set the class room into a roaring laughter.

In order to keep pace with the advances made in the subject elsewhere he sincerely advised the students to study German and French, and particularly he used to emphasise that it was absolutely essential to study German to complete one's study of mathematics.

Outside the class-room Professor Kosambi was an intimate friend to all students. He treated them as members of a family, posing himself as a *Pater familia*. He was a source of inspiration to students as he went on talking about social and political problems. In private he used to discuss prominent Indian personalities. I quite remember when he started discussions about Dr. Zakir Hussain, the then

President of India, as an Economist. He was full of praise for him and always took the opportunity of meeting him.

He was a great mathematician of the subcontinent. He left Aligarh after Dr. Andreville and Dr. Raghavan. Later on he joined the Fergusson College, Poona and served the people of Maharashtra. His death is a great loss to the mathematical world.

Birkhoff

My father, George David Birkhoff, took a warm personal interest in "Kosambi" (as he was known to the Harvard Mathematics Department), whose many-sided brilliance and charm stood out in classroom and living room alike. The versatility and originality of his later mathematical work which (like some of Wiener's work) showed imaginative insight even when it was not rigorous, amply justified this early promise.

Kosambi's World View

Kusum Madgavkar

MADGAVKAR, KUSUM: Niece of Prof. Kosambi and knew him from childhood. Born and educated in Bombay. Now living in Delhi. Does occasional writing for journals. *Address:* C/O The Bank of India, Janapath Road, New Delhi 110 001.

Kosambi's mind was versatile. Though a scientist and mathematician by profession, he took an interest in history, and brought to its methodology an original approach. Kosambi was a Marxist by conviction, and his definition of science has Hegelian echoes--"Science is the cognition of necessity."

Science had a continuity that other subjects lacked. He often said, "I stood on other people's shoulders, still others will stand on mine." The job of science, he wrote, was to make "better and better approximations to the truth", ('Science and Freedom') but for science to make an advance, the scientist needed freedom, yet he found himself surrounded by restrictions on what to think and what to say. For instance, Galileo's astronomy was thought dangerous, because Galileo by stating factually what he saw, challenged the prevalent theory of the ruling class and its right arm, the Church, so that "...by implication the rest of the social system was also laid open to challenge, something no man is free to do without risk," (*E.E.*, p. 49) then or now. Kosambi spoke from personal experience. He knew the fetters Big Business could and did place on a scientist with an inquiring mind, questioning all matters.

Science flourished when the scientist carried on his investigations unhampered, which was the case during political upheaval, when a new class gained power. Along with the rising class came a bumper crop of scientists: Newton, for example, whose discoveries coincided with the rise of the bourgeoisie in England. Famous French scientists sprung up after the French Revolution smashed the feudal system. The bourgeoisie needed and encouraged scientific discoveries. But to Kosambi

there was no justification to tie science to the apron strings of a decaying class just because that class in its prime 400 odd years ago, had brought into existence science as we know it today. The world and the bourgeoisie have changed since then and the scientist needs to be free of that class, for, "...if he serves that class which grows food scientifically and then dumps it into the ocean, while millions starve all over the world, if he believes the world is over-populated and the atom bomb is a blessing that will perpetuate his own comfort, he is moving in a retrograde orbit on a level no beast could achieve." (*Science and Freedom*)

Though not prone to imagine virtues in the bourgeoisie, Kosambi gave that class full credit for being the harbinger of modern science. But the bourgeoisie *per se* is not essential to scientific growth and the reason why the scientist in today's capitalist society feels choked is that the class he serves fears the change it sees in a different social structure which has managed to survive and to thrive without a bourgeoisie. This difference cannot be freely discussed by scientists in the 'Free World' he noticed. For if they did, they risked losing their jobs. Studying a different social structure, inquiring into and questioning the social need for the bourgeoisie, or for classes today, are topics debarred from scientific inquiry.

After World War II, scientists grew worried about their dwindling freedom, which Kosambi found out, meant pursuing their work in their chosen field, and being paid for it by Big Business, war departments, or universities whose funds depended chiefly on these two sources. So scientists were "under the necessity of producing regular output of patentable or advertising value while avoiding all dangerous philosophical or social thought." (*Science and Freedom*)

Kosambi laid bare the class basis of science and called it "the theology of the bourgeoisie". In the days of handicraft production, before machines came in, technical knowledge was passed on slowly and production limited. And when the indebted craftsman mortgaged his tools, they brought no profit to the usurer though the craftsman starved. So there came into being a new class whose labour could be exploited. The usurer became the capitalist and the craftsman formed the proletariat. This necessitated fresh thinking to fit in a managing class which doesn't handle the tools of production. Here Science came into its own, and Galileo's study of pumps, for instance, resulted both in hydrostatics and more efficient pumps, because, "Science is nothing if it does not work in practice. In Science, practice and theory cannot be divorced." (*E.E.*, p. 44) Kosambi often stressed that science was not the result of talented people thinking up scientific problems in their minds. Only when there was the social need, did the necessary invention come up. Dialectical materialism was the method Kosambi followed in his study of ancient Indian history in which source material is meagre and chronology, extremely difficult to fix. Kosambi's basic method of tackling chronology was by demarcating periods in history according to the means of production, not by battles or changes in dynasty. But here too, Kosambi recognized that in an undeveloped society, socio-economic forces guiding historical development, major wars, major changes in rulers, major religious upheavals, all revealed the fundamental changes in productive relations. Kosambi regarded these as basic, while they had been ignored by earlier bourgeois scholars. In addition, India had an uneven course of development, what with the size of the country, the different languages and differing natural environments, so that even if some ancient document did reveal the mode of production and so the level of development of that society, it would be a job to fix its chronology. Unlike Brahmin records, Kosambi found Jain records more dependable. The Jains had a large number of traders to whom years and dates meant something, and they had to get their records straight.

Another difficulty faced by any student of ancient Indian history, was the terms used. Terms can be, and have changed their meaning, and Kosambi noted that this was more so in India where the priestly control over Sanskrit led to secrecy, to memorising, and consequently, to ambiguity. Kosambi suggested that a scientific Indian chronology would be possible only by the method of citation. Researching into the earliest mention of customs, techniques, and foodstuffs was one of his methods. "Digging in the right places" could help evaluate written sources, such as the Mahabharata War or Rama's invasion of Lanka.

Slavery in India was another disputed issue to which Kosambi tried to find an answer by relating it to the method of production. Greeks and Romans, accustomed to slaves, couldn't recognize any class that looked like their own slaves. Besides, neither in inscriptions nor in literature is there any mention of slaves taken in battle, slave marts or caravans of slave traders. Kosambi concluded that *dasa* or *sudra* were alternate terms describing the same thing. The caste system according to Kosambi prevented slavery in India in the Greco-Roman sense. The Aryans destroyed the earlier Indus Valley civilization, with an urban population comparable to the early Sumerian. The urban population must have been kept going by a large, surplus-producing agrarian population, who became the *dasas*. The Rgveda mentions two *varnas*, as caste was then known--the *Arya* and the *Dasa*. Later on *Dasas* acquired the meaning of *Sudra* and the *Sudra* served the three upper castes. The other ground on which Kosambi refutes the possibility of classical slavery in ancient India is that at the time of the Aryan invasion, the Aryans had no private, only tribal property, and the *Sudras* were the slaves of the entire tribe.

In the course of his study of ancient Indian history, Kosambi found tribal people whose lives, because of the availability of food, had remained basically unchanged when too much deforestation hadn't ruined their traditional food and living habits. With plough agriculture began the mutual acculturation of food gatherers and farmers, who, in time, found their place in the caste system, and the food gatherers contributed their two main don'ts -- not accepting food from a stranger and no marriage outside the tribe -- to the caste system. Kosambi also traced the tribal origins of many Hindu deities. One of the tribes he studied, was the *Ras Phad Pardhis*, nomads of the Deccan.

Field work played an important part in Kosambi's study of history. He came by evidences of mutual acculturation first hand. He went over to the farmers, unmindful of heat, dust, or their unhygienic conditions. More important, he crossed the barriers formed by generations of poverty on the one hand and exploitation on the other. "Such field work," he wrote, "has to be performed with critical insight, taking nothing for granted or on faith, but without the attitude of superiority, sentimental reformism or spurious leadership." (*I.S.I.H.*, Pref. vii)

Dialectical materialism found its way into Kosambi's views on literature. He felt that arrangement of words alone did not make an author great and that Shakespeare's greatness was due to his expressing a new class basis. In those days, the bourgeoisie was the rising class, and their interests coincided with those of the oppressed. To be great, Kosambi held, a poet had to show up some part of the social structure and the seeds of its negation, which happened during the emergent stage of a new class. With his scientific mind always on the lookout for suspicious coincidences from which to draw general truths, he felt: that was why the greatest names in literature come at the emergent and not the decadent period of a particular class, and why literature, fulfilling these requirements outlasts the society it reflected.

But after a socialist revolution, somehow, the literature in the socialist country lacks both the power and the literary forms which arose during earlier social upheavals. Kosambi, with his critical admiration for socialist achievements explained: that was because the new class in earlier societies emerged while the old class was dominant. The new class turned to literature to express its hopes and aspirations because any political expression was denied it. But when in a socialist society, the working class gains power, it gains political expression. The struggle has always been bitter, and the new, socialist country tries to reach the advanced level of the older capitalist countries, which have probably tried to kill its socialist revolution. On the literary front, writers face another difficulty, in that they have spent their formative years in the old society. Classless society did not exist as far as one can remember; and the literary production takes on what Kosambi called the 'boy-loves-tractor' pattern. Party directives and writers' conference resolutions cannot remedy the situation. The cure, as Kosambi saw it, was to abolish illiteracy and make classical works in that language easily available. In addition, he felt that some way had to be found to link the aesthetics of the new socialist society to production, and then new art forms would develop, as music did, originally, to make the crops grow, and dance, drama, painting and sculpture originated in primitive initiation rites and sym- pathetic magic.

But these developments, however beneficial to mankind, need one pre-requisite, peace. The argument that war requirements allotted vast funds for research and scientific development, was, he felt, "vicious." He wrote, "Quite apart from the destructive- ness of total war, the crooked logic of Big Business and war- mongers is fatal to the clear thinking needed for Science." (*E.E.*, p. 97) Kosambi felt that lasting peace had to be based on "true democracy", where all men were truly equal and no one could claim any superiority by virtue of any right whatsoever, whether divine, of birth, conquest or that of private property. Otherwise peace, as imperialists have seen it over the centuries, would have no meaning. Kosambi often quoted Tacitus on the subject, who had written, "He made a desert and called it peace," referring to a contemporary Roman Emperor. To Kosambi, it was "twisted logic" that waged war in the name of peace, and "which bombs people indiscriminately to save them from Communism." (*E.E.*, p. 96)

Being an active fighter for peace, Kosambi went into the causes that prevent peace, and saw in food a powerful weapon in the war against mankind, excepting that fraction of the people to whom food is a very minor item of expenditure. "In a word it is class war, and all other wars of today stem from attempts to turn it outward. Even the Romans knew that the safest way to avoid inner conflict and to quiet the demands of their own citizens, was to attempt new conquests." (*E.E.*, p. 97) World War III, Kosambi felt, was not inevitable, and that public opinion, once aroused, could stop it; and he spared no effort in mobilising that public opinion. He also felt that colonial liberation would help the cause of world peace, being one step towards making "have-not" countries a thing of the past.

Kosambi's approach to life was based on his Marxism -- but not its blind, uncritical application. "Marxism cannot be reduced to a rigid formalism like mathematics, nor can it be treated ' as a standard technique such as an automatic lathe." (*E.E.*, p. 4)

The way to cherish Kosambi's memory is to acquire a mastery over his methods.

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12 A Tribute in Verse

Beram Saklatwala

SAKALATVALA, BERAM (b. Manchester, U.K.), educated at Holloway School (now a Comprehensive), University College, London, and the Working Men's College, London. He has been working for the House of Tata for some 35 years and is the Managing *Director* of Tata Ltd., London.

I had the honour of knowing Kosambi for many years. I first met him when he was in England as a guest of the British Council to give a series of lectures, to which he invited me. I knew him by repute as a mathematician and therefore declined to go to the lectures since they would clearly be above my head. He reacted somewhat violently to this thought of mine and told me that in fact his lectures were to be on the subject of mesolithic archaeology. It was thus for the first time that I realised how broad were his interests and how complete a polymath he was. His interests were extra-ordinarily wide-ranging. When I took him to Salisbury Plain to show him the great monument of Stonehenge, I found that he was familiar with all the back- ground and with all the interpretations put upon the monument by English antiquarians since the seventeenth century. He was well read in medieval Latin texts, an authority on the punch- mark coins of western Asia, skilled in the science of genetics. Like a latter-day Lord Bacon, he had taken all learning to be his province. He was not only learned but a stimulator of learning in others.

In 1951 Kosambi published a paper on the Rgveda (*JBBRAS*, 27, 1951, pp. 1-30). In this paper he transliterated the original Sanskrit text into the Roman alphabet, thus making the original language available to people like myself with no knowledge of the Sanskrit script. He published with the transliterated text a literal English prose translation.

In his paper, Kosambi proposed that the passage RV. X. 95 was not a narrative of factual events but rather a formal dialogue from some ritual now lost. In discussing the matter with Kosambi I was impressed by the percipience of his interpretation and caught some of his ebullient enthusiasm.

Sir John Frazer's monumental work *The Golden Bough* proposed that early religions were based on man's mystical interpretation of the mystery of growing crops. The central figure was usually a corn goddess. She was represented by, and often identified with, a priestess. To ensure the fertility of the crops, a man was chosen to be her husband for a year. At the end of that time he became a human sacrifice and his remains possibly scattered over the fields in a fertility rite. Thus his body underwent neither of the two rituals which were normal, those of inhumation or cremation. This interpretation gave a new and more vital meaning to the words of the passage. Once the passage was seen as a dialogue between the priestess and her husband, to be used in a liturgical play, after the human sacrifice had been dropped, new and special meanings were revealed.

With Kosambi's permission I turned his prose translation into a verse translation, since the Rgveda itself was of course written in poetry. I added two introductory verses to set the scene. For the rest, *the* translation is quite literal. I have merely added one or two words to each verse to show whether it was the priestess or her fated husband who was speaking.

URVASI AND PURORAVAS

Out of all men, one man the goddess chooses
As bridegroom for her priestess: one elected
To share immortal loving: one that loses
By force his earthly shape, for heaven selected.
With the immortal goddess he shall lie,
To make her fruitful, and then fruitless die.
After the sacred year, and the many dangers,
The separation and the loss of love,
The mortal and the goddess (no more strangers)
In quiet harmony their passion prove.
But now the darkness comes, and now the fear
Of their strange mating in the sacred year.
Speaks now the mortal: "You who were my wife,
Loving and kind, what transformation now
Changes your beauty? What immortal strife
And what dread purpose marks your lovely brow?

O break your purpose! Let me sing your praise,
Lest dead and fruitless be our distant days."

But, pitiless, the goddess now replied:

"Of what use now your songs? No more you see

The passionate lover or the willing bride.

As the dawn vanishes so vanished she.

The bride's but air, and mortal is the groom;

Return, poor mortal, to your mortal doom."

He spoke again, defiance in his eyes,

(Angry the heart when destiny draws near):

"Look. As an arrow to the quarry flies,

So came I to you, clean of any fear.

Without such courage shall the heart not shine.

The lamb's voice, crying, is no voice of mine."

"You spoke of dawn," he said, "and the dawn each day

Renews her beauty, after the loving night.

In some dark bridal chamber laid away,

Embraced by darkness, rising still more bright.

Such is the power of loving, to renew

The dawn for ever: so my love for you."

"Ah, love," the goddess said, "You did embrace

And take me wholly, as a living fire.

Unwilling was my body, and my face

Turned from you, yet I yielded to your desire.

Though I a goddess, you were king of all

My body's realm, and held me in your thrall."

Then memory stirred within him, and a dream

Of dancing figures on their bridal day,

White figures dancing where the waters gleam;

In the clear pool their image danced as they.

He saw the garlands, and the cattle hung

With sacred flowers. He heard the old songs sung.

She spoke again: "When you were born," she said,

"The wives of all the gods were there, and knew

The destiny prepared, the road you'd tread.

The stream which made the gods have made you too.

Now is the battle joined for which you're made,

Your victory near. Be swift and unafraid."

Again he dreamed: "Once, on a river's side

I saw the nymphs, and touched their nakedness.

From me they started, as the deer that hide

From the swift hunter in the wilderness.

They leap as horses leap, who feel the sting

Of sudden whip and stretch their galloping."

She laughed, remembering: "When a mortal lover,

Young as you then were young, and fair as you,

(But youth and beauty both will soon be over)

Seeks out the nymphs, as once you used to do,

Then--like the swans--they show their beauty gay,

Leaping and running like a horse at play."

"But then you came," he said, "with joy and laughter,

Made me forget my nymphs, and made me run

From their false rivers to the true clear water

Which my heart craved. Your body bears my son.

One further wish I ask you now to give,

Goddess and wife--O let your lover live!"

"Great was your birth" she said, "and great your power.

But all your greatness did you give away,

Yielded to me upon our bridal hour;

I waned you truly on that selfsame day.

You did not heed. Impatient was your passion.

Possession won, your heart has changed its fashion."

"Cruel!" he said, "and must my unborn son,

Asking for me across the fruitless years,

Hear of my fate, and feel the hot tide run

Of sorrow, and the hood of bitter tears?

By what right do you now attempt to part

Husband and wife, kind heart from loving heart?"

"Your son shall weep indeed," the goddess said,

"Until he learns my office. Then shall he,

Knowing your fate and mine, be comforted.

Go pray no more, but meet your destiny.

You found, in love, a mortal lip and brow.

The mortal fool may touch no goddess now."

"Out Of your mercy," he replied, "I may

Neither my joy nor even my life recover.
Since love is gone, let life itself give way.
If love be dead, O perish then the lover.
My flesh the wolves shall eat when I shall die
If not with you, then with cold death I'll lie."
"That lovely flesh," she said, "no wolves shall eat.
Neither with me, nor yet with death you'll lie.
Strange is your fate, and when your hour's complete,
You'll know the secret of your destiny."
"In woman's heart no man shall find a friend,"
He said, "the wild beast dwells there in the end."
"No woman I," she said with darkening eyes,
"Though as a woman did I dwell with you,
A goddess, still, though in a different guise.
My passions many though my feastings few.
Pasting I waited in my mortal dream,
Tasting a little curd, a little cream."
Then he submission made and said: "Prepare
The sacrifice, my goddess, and receive
This mortal flesh, O you who fill the air.
I take my destiny and do not grieve.
Blessings be yours for all our sacred year.
And yet, turn back, my heart is hot with fear!"
Now, all her mortal semblance cast away,
Goddess entire, she spoke: "Because you die,

The gods shall bless you, and your son shall pray,

Serving the gods with holy piety.

Priest, King, and god he shall be by your deed,

And for your blessing shall the gods take heed."

(The above is a version of RV. X. 95 as interpreted by Kosambi in *JBBRAS* 27, 1951, pp. 1-30, with two introductory verses; the rest constitute an attempt to reconstruct the ritual described in the Rgveda and the original, actual sacrifice from which the hymn was derived.)

Damodar Dharmanand Kosambi

V. V. Gokhale

GOKHALE, V. V. (b. 1901 at Kolhapur), educated at Kolhapur, Poona, Bombay, Santiniketan, Heidelberg and Bonn, where he obtained D. Phil. in Indology, Sinology, and Philosophy in 1930. Professor and Life Member (of the Deccan Education Society at Fergusson College, Poona (1932-1959)) Head of the Dept. of Buddhist Studies, Delhi University (1959-66), then Professor at Poona University, Director of Research Studies at Cheena Bhavan, Visvabharati (1937-38), Officer on Special Duty, Indian Mission at Lhasa, Tibet, (1948-50). Collaborated with D. D. Kosambi in his work on *Brathari* and as co-editor of the *Subhasitaratna* Kosa of Vidyakara (Harvard Or. S., Vol. 42, 1957). Writings include monographs in Mahayana Buddhism, including first edition of Vasubandhu's (*JBBRAS*, 1946), discovered in Tibet, etc.). Address: 39-14-15, Prabhat Road, Poona, 411004.

Death overtook Prof. D. D. Kosambi in his bed in the early hours of the 29th June 1966 prematurely and almost surreptitiously, after he had been declared generally fit on the previous day by his family doctor. It was a case of myocardial infarct. A glance at the list of his publications given elsewhere will bring home to us the serious loss the world of progressive and talented writers has suffered and the void his death has left among the leading savants of nascent India.

Born at Kosben in Goa, then under the rule of the Portuguese colonialist, Damodar Kosambi was brought up in a family known for its rigorous standards of learning and social behaviour. He had inherited from his father, the renowned Buddhist scholar: Dharmanand Kosambi, an insatiable spirit of inquiry, a love of wandering and a sharp, versatile intellect, which took him quickly ahead of his co-workers and gave his views a rare sense of originality. After some schooling in India, his father, who had accepted a teaching assignment at Harvard (U.S.A.), took him to the Cambridge Latin School, where as a boy of eleven he dedicated himself to a student's hard life until after about eight years we see him emerging as a brilliant young graduate of the Harvard University in Mathematics, History and Languages. On returning to India he worked for a few years at the Banaras Hindu University and then at the Aligarh Muslim University before he decided to settle down in Poona in 1932 as Professor of Mathematics at the Fergusson College,--known for its pioneering services in the field of National Education, and where father had taught for many years and laid the

foundations of Buddhist Studies in Western India. It was during the crucial period of fourteen years he spent at this College, which he in lighter vein characterized as "Rama's exile into the wilderness", that Prof. Kosambi carried on an incessant struggle for mastery in various fields of knowledge and laid the foundations of his greatness as a scholar and a thinker.

Endowed with a powerful and far reaching imagination and an outstanding mathematical ability, Kosambi, who had concentrated his mind almost exclusively upon mathematical research up to 1939, was gradually led to use his abstract methods for obtaining new results in various branches of social sciences. He began by applying statistical methods to Indian numismatics. He was seen weighing with the utmost precision and unremitting zeal thousands of punch-marked coins obtained from different Museums in the country and thrashing out his data until he could establish their chronological sequence, forward convincing arguments regarding the economic conditions under which they could have been minted, and discover facts about the dynastic history of the pre-Mauryan period, based upon a wide study of the ancient literary sources and his new meteorological findings. The more he examined the productive spirit working behind the panorama of Indian history, the more charmed he was by the manifold aspects of Indian culture, the past as well as the pre- sent. While giving mathematical precision to his ideas in the various branches of humanities, he turned almost instinctively to his Sanskrit inheritance. His frank and scholarly estimate of Bhartyhari's Aphorisms and later of *Vidyakara's* anthology: *Subhasitaratnakosa* was a standing testimony to his versatile genius and quick mastery of the latest advances in literary criticism. In these and other Indological studies covering a wide range of subjects from the Vedic and the Epic to the classical literature of India he owed as much to Sukthankar's Prolegomena to the critical edition of the *Mahabharata* as to the most modern standards of literary criticism in the West.

Being deeply preoccupied with the entire field of knowledge as it were it was no wonder that his mathematical lectures in the Fergusson College seemed to go well over the heads of the post-graduate candidates. That as a result of this Kosambi had to leave the College, ought to open our eyes to the dangers involved in our borrowing an examination-ridden system and uninspiring standards of education in this country. The width of his comprehension and his penetrating researches, however, had been making their mark among the scientific circle of India and abroad. It was not long before he was offered the Chair for Mathematics in the Tata Institute of Fundamental Research of Bombay in 1946 which he held for the next 16 years. The new position offered him opportunities of developing closer contacts with scholars of his own calibre all over the world and of meeting his financial responsibilities better than before. Kosambi, however, could not relish the conditions under which he had to work. Living in his own house in BORI Colony Poona, he had to march every morning to the Railway Station and make the "Deccan Queen" his second home in order to attend to his duties in Bombay. Besides, a man of his temperament, solely dedicated to the pursuit of knowledge and social enlightenment was entitled, he thought, to a freedom of thought and action, such as we hardly expect to meet with in an emergent society struggling for its economic independence. All the same, he was able now not only to give a final shape to some of his earlier studies, but to launch upon new orientations in the fields of Biology, Archaeology, Anthropology and pre-History. And every now and then we see him turning back from his study of the social sciences to the development of his research in the comparatively abstract or pure fields of science: the last book he sent out for publication dealt with Prime Numbers. His last major work: *The Culture and Civilization and Ancient India* (London, 1965), which has now come to be translated into several European and Asiatic languages, set the seal of recognition on his vast

erudition, his ability to discover basic motives of human civilization and his brilliant powers of exposition.

It is not for us to estimate the scientific advances made by Prof. Kosambi in the fields of Genetics, Statistics and Mathematics or the part played by him in various other spheres of activity, e.g., in his capacity as Member of the World Peace Council visiting the socialist countries of the East and the West. He believed in the Marxist method of interpreting and changing the human society, but did not hesitate to revise the data of Marx himself in the light of modern research. As an independent thinker with a passionate devotion to scientific research, he seemed to be almost exclusively preoccupied with his own intellectual pursuits. As such he was sometimes accused of brusqueness and intolerance, but he had obviously no use, nor time for all the sophistications of our normal social life, nor could he afford to waste his energies on empty rituals and ceremonies, except for treating them as objects of his anthropological studies. And yet, whenever he found some time to relax, his childlike simplicity and sparkling wit were most refreshing even to those who were nearest to him and he spread laughter and sunshine around him. Towards his friends he was generous to a fault. His inner life was marked by an unmistakable streak of asceticism, while his ethical standards - were unusually high and severe. Prof. D. D. Kosambi deserves to be remembered as one of the highly gifted and versatile scientific workers and indefatigable scholars of modern India for whom a relentless search for the highest human values was the only natural way of life.

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